

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) An equipment diagnosis device comprising:
an instrument ~~means~~ unit for measuring a plurality of instrumentation amounts for the equipment sucking and discharging a fluid;
an arithmetic ~~means~~ unit for performing the arithmetic operation on the correlation between the plurality of instrumentation amounts that are measured; and
a normal state quantity storage ~~means~~ unit for storing the state quantities including at least the correlation between ~~said~~ the plurality of instrumentation amounts as the state quantities in the normal condition of ~~said~~ the equipment, the state quantities being arithmetic values such as a mean value obtained from the instrumentation amounts measured when the operation is judged to be normal;
~~characterized in that~~ wherein the state quantities of the abnormal condition are obtained by making the arithmetic operation from the state quantities of the normal condition stored in ~~said~~ the normal state quantity storage ~~means~~ unit.

2. (Currently Amended) An equipment diagnosis device comprising:
an instrument ~~means~~ unit for measuring a plurality of instrumentation amounts for the equipment sucking and discharging a fluid;
an arithmetic ~~means~~ unit for performing the arithmetic operation on the

correlation between the plurality of instrumentation amounts that are measured;

a normal state quantity storage ~~means~~ unit for storing the state quantities including at least the operated correlation between said the plurality of instrumentation amounts as the state quantities in the normal condition of said the equipment, the state quantities being arithmetic values such as a mean value obtained from the instrumentation amounts measured when the operation is judged to be normal;

an abnormal state quantity storage ~~means~~ unit for presetting a threshold to judge the state quantities in the abnormal condition; and

a judgement ~~means~~ unit for judging at which the current state quantities are among at least three or more stages, including a normal stage, an abnormal stage and an intermediate stage between the normal or abnormal stages by comparing the current state quantities including at least the state quantity in which said the arithmetic ~~means~~ unit makes the arithmetic operation on the correlation between said the plurality of instrumentation amounts for said the fluid as the variables during the current operation of said the equipment and the state quantities of the normal state stored in said the normal state quantity storage ~~means~~ unit or said the threshold.

3. (Currently Amended) An equipment diagnosis device comprising:

an instrument ~~means~~ unit for measuring a plurality of instrumentation amounts for the equipment sucking and discharging the fluid;

an arithmetic ~~means~~ unit for performing the arithmetic operation on the correlation between the plurality of instrumentation amounts that are measured;

a state quantity storage ~~means~~ unit for storing the state quantities including at least the operated correlation between ~~said~~ the plurality of instrumentation amounts as the state quantities in the normal condition of ~~said~~ the equipment, the state quantities being arithmetic values such as a mean value obtained from the instrumentation amounts measured when the operation is judged to be normal, or storing the state quantities including at least the correlation between the plurality of instrumentation amounts operated by ~~said~~ the arithmetic ~~means~~ unit from the plurality of instrumentation amounts measured when ~~said~~ the equipment is judged as the abnormal condition or set to achieve the abnormal condition as the state quantities in the abnormal condition of ~~said~~ the equipment; and

a judgement ~~means~~ unit for inferring the extent or cause of abnormality if it is judged that the current operating condition is not the normal state by comparing the current state quantities including at least the state quantity in which ~~said~~ the arithmetic ~~means~~ unit makes the arithmetic operation on the correlation between the plurality of instrumentation amounts for ~~said~~ the fluid as the variables during the current operation of ~~said~~ the equipment and at least one of the state quantities of the normal state and the state quantities of the abnormal state which are stored in ~~said~~ the state quantity storage ~~means~~ unit.

4. (Currently Amended) The equipment diagnosis device according to claim 1, ~~2 or 3, characterized by~~ further comprising comparison ~~means~~ unit for comparing the distances between the current state quantities in the current operating condition including at least the state quantity obtained by arithmetic operation on the correlation between ~~said~~ the plurality of instrumentation amounts as a plurality of

variables with the state quantities of ~~said~~ the normal condition or abnormal condition that are stored, wherein the degree of abnormality in the operating condition is judged from a change in the distance from the state quantities of ~~said~~ the normal state or the state quantities of ~~said~~ the abnormal state, while ~~said~~ the comparison means unit repeats the comparison in the operating condition.

5. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 4, characterized in that~~ claim 1, wherein the state quantities of ~~said~~ the current operating condition or the state quantities of ~~said~~ the abnormal condition provide a plurality of different aggregates having different instrumentation amounts or variables.

6. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 5, characterized in that~~ claim 1, wherein the degree of abnormality of the state quantities in the current operation can be displayed by classifying the distances between the state quantities of ~~said~~ the normal state and the state quantities of ~~said~~ the abnormal state.

7. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 6, characterized in that~~ claim 1, wherein a range for setting the normal operating condition or a threshold for judging the abnormal state is acquired by having the instrumentation amounts that are measured or the arithmetic values such as a mean value obtained from ~~said~~ the instrumentation amounts, converting compulsorily at least one of ~~said~~ the measurement amounts or ~~said~~ the

arithmetic values into another value, and making the arithmetic operation on the composite variables including the value after conversion.

8. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 7, characterized in that said~~ claim 1, wherein the judgement means unit judges whether the operating condition of the fluid equipment such as a compressor, a pump or an air blower that treats a combustible fluid or a fluid harmful to the human body, or a driving apparatus of ~~said~~ the fluid equipment, is normal or abnormal.

9. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 8, characterized in that said~~ claim 1, wherein the equipment is the fluid equipment for circulating the fluid, and ~~said~~ the judgement means unit discriminate a change in the physical quantities of the fluid indicating a nonconformity situation occurring when ~~said~~ the fluid leaks from ~~said~~ the equipment or the apparatus connected to ~~said~~ the equipment, or sucked in a liquid state into ~~said~~ the equipment, ~~said~~ the equipment is deteriorated, a flow passage for circulating ~~said~~ the fluid is clogged, bent or broken at any position, ~~said~~ the fluid is deteriorated, or the operation of another constitutional apparatus connected to ~~said~~ the flow passage of the fluid for ~~said~~ the equipment is out of order, or judging that any abnormality thereof is included.

10. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 9, characterized in that~~ claim 1, wherein the instrumentation

amounts measured during the operation of ~~said~~ the equipment are the physical quantities of the fluid, the quantities of electricity for driving ~~said~~ the equipment driving ~~means~~ unit, or the quantities of electricity occurring from ~~said~~ the equipment during the operation of ~~said~~ the equipment, in which the quantities of electricity occurring during the operation of ~~said~~ the equipment include an electromagnetic force, an electric wave, a leakage current and a shaft voltage.

11. (Currently Amended) The equipment diagnosis device according to ~~any one of claims 1 to 10, characterized in that said~~ claim 1, wherein the judgement ~~means~~ unit judges whether or not ~~said~~ the equipment is in the normal operating condition based on whether or not the state quantities in the current operating condition lie within a range of threshold indicating the normality or out of a range of threshold indicating the state quantities of the abnormal condition, and infers a failure time of ~~said~~ the equipment from the relationship between the state quantities of the current operating condition and the threshold.

12. (Currently Amended) A refrigerating cycle apparatus ~~characterized by~~ comprising:

a refrigerating cycle formed by connecting a compressor, a condenser, expansion ~~means~~ unit and an evaporator via a pipeline, and flowing a refrigerant through the inside thereof;

a high pressure side measurement ~~means~~ unit that is high pressure measurement ~~means~~ unit for measuring the high pressure of a refrigerant pressure at any position on a flow passage leading from the discharge side of ~~said~~ the

compressor to ~~said the~~ expansion means unit or condensation temperature measurement ~~means~~ unit for measuring the saturation temperature at ~~said the~~ high pressure;

a low pressure side measurement ~~means~~ unit that is low pressure measurement ~~means~~ unit for measuring the low pressure that is the pressure of refrigerant at any position on the flow passage leading from ~~said the~~ expansion means unit to the suction side of ~~said the~~ compressor or evaporation temperature measurement ~~means~~ unit for measuring the saturation temperature at ~~said the~~ low pressure;

a refrigerant temperature measurement ~~means~~ unit that is liquid temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from ~~said the~~ condenser to ~~said the~~ expansion means unit, discharge temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from ~~said the~~ compressor to ~~said the~~ condenser, or suction temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from ~~said the~~ evaporator to ~~said the~~ compressor;

an arithmetic ~~means~~ unit for performing the arithmetic operation on the composite variables from the measured values of ~~said the~~ high pressure side measurement ~~means~~ unit, ~~said the~~ low pressure side measurement ~~means~~ unit and ~~said the~~ refrigerant temperature measurement ~~said the~~; and

a judgement ~~means~~ unit for judging the abnormality of the refrigerating cycle based on the comparison result by comparing the values stored in the past and the

current measured values or arithmetic values, as well as storing each of said the measured values or said the arithmetic values.

13. (Currently Amended) A refrigerating cycle apparatus ~~characterized by~~ comprising:

a refrigerating cycle formed by connecting a compressor, a condenser, expansion ~~means~~ unit and an evaporator via a pipeline and flowing a refrigerant through the inside thereof;

a normal state quantity storage ~~means~~ unit for storing, as the state quantities of a normal operating condition, the state quantities including at least the state quantity obtained by making the arithmetic operation on the correlation between a plurality of measured values as a plurality of variables when said the refrigerating cycle is normally operating;

an abnormal state quantity storage ~~means~~ unit for storing, as the state quantities of an abnormal operating condition, the state quantities including at least the state quantity obtained by making the arithmetic operation on the correlation between the plurality of measured values as the plurality of variables when there is an abnormality in said the refrigerating cycle;

a comparison ~~means~~ unit for comparing the distances between the current operating state quantities including at least the state quantity obtained by making the arithmetic operation on the correlation between the plurality of measured values in the current operating condition of said the refrigerating cycle as the plurality of variables and the plurality of state quantities stored in said the normal state quantity

storage ~~means~~ unit or the plurality of state quantities stored in ~~said~~ the abnormal state quantity ~~means~~ unit; and

a judgement ~~means~~ unit for judging a degree of normality, ~~an~~ a degree of abnormality or a cause of abnormality of ~~said~~ the refrigerating cycle from the distances compared by ~~said~~ the comparison ~~means~~ unit or a change in the distance.

14. (Currently Amended) The refrigerating cycle apparatus according to claim 12 ~~or 13, characterized in that~~ wherein the judgement ~~means~~ unit for judging the operating condition of ~~said~~ the refrigerating cycle discriminates a refrigerant leakage from ~~said~~ the refrigerating cycle, a refrigerant liquid back-flow to ~~said~~ the compressor, a deterioration due to the lifetime of ~~said~~ the compressor, a blemish or rupture on the surface of heat exchange for ~~said~~ the condenser or ~~said~~ the evaporator, a deterioration or failure of a blower unit of ~~said~~ the condenser or ~~said~~ the evaporator, clogging of a strainer for removing the contaminant inside the pipeline through which ~~said~~ the refrigerant is circulated, clogging of a dryer for preventing the humidity of refrigerant, a bend, rupture or clogging of ~~said~~ the pipeline, or a deterioration of a refrigerator oil useful for ~~said~~ the compressor, or discriminates whether or not any of ~~said~~ the abnormalities is involved.

15. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 14, characterized by~~ claim 12, further comprising learning ~~means~~ unit having at least one state quantity of a numerical value representing the correlation of making the arithmetic operation on ~~said~~ the plurality of measured values, the plurality of arithmetic values from ~~said~~ the measured values, or ~~said~~ the

plurality of measured values or arithmetic values as the plurality of variables, and learning at least the numerical value representing the correlation calculated as ~~said~~ the plurality of variables in learning the state quantities of the state where ~~said~~ the refrigerating cycle is normally operating.

16. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 15, characterized in that said~~ claim 12, wherein the judgement ~~means~~ unit for judging the operating condition of ~~said~~ the refrigerating cycle acquires a threshold for distinguishing between the normal operating condition and the abnormal operating condition by having ~~said~~ the measured values or the arithmetic values such as a mean value obtained by the arithmetic operation on ~~said~~ the measured values, compulsorily converting at least one of ~~said~~ the measured values or ~~said~~ the arithmetic values into another value, and making the arithmetic operation on a plurality of variables including the value after conversion.

17. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 16, characterized in that~~ claim 12, wherein the state quantities of the abnormal operation used by ~~said~~ the judgement ~~means~~ unit for judging the operating condition of ~~said~~ the refrigerating cycle are obtained by compulsorily converting any one of ~~said~~ the measured values or ~~said~~ the arithmetic values obtained by making the arithmetic operation on ~~said~~ the measured values into another value, ~~said~~ the values converted into ~~said~~ the another value including the measured value by refrigerant temperature measurement ~~means~~ unit that is liquid temperature measurement ~~means~~ unit for measuring the temperature at any position

on the flow passage leading from ~~said~~ the condenser to ~~said~~ the expansion means unit , discharge temperature measurement means unit for measuring the temperature at any position on the flow passage leading from ~~said~~ the compressor to ~~said~~ the condenser, or suction temperature measurement means unit for measuring the temperature at any position on the flow passage leading from ~~said~~ the evaporator to ~~said~~ the compressor, or the arithmetic value obtained by making the arithmetic operation on the measured value.

18. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 17, characterized by~~ claim 12, wherein judging the degree of abnormality of ~~said~~ the refrigerating cycle from the value obtained by making the arithmetic operation on an aggregate in which ~~said~~ the plurality of variables are combined and associated with each other, and calculating the arithmetic operation result, and predicting a critical time at which ~~said~~ the refrigerating cycle can not continue a stable operation.

19. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 18, characterized in that~~ claim 12, wherein in comparing the distances between the current operating state quantities including at least the state quantity of correlation of making the arithmetic operation on the plurality of measured values from the current operating condition of ~~said~~ the refrigerating cycle as the plurality of variables, and the plurality of normal state quantities stored or the plurality of abnormal state quantities stored, a comparison is made between a refrigerant leakage amount that is the operated state quantity in the current operation or its

equivalent arithmetic value and a preset refrigerant amount within ~~said~~ the refrigerating cycle, a permissible refrigerant leakage amount or its equivalent state quantity, to predict the time to lead to a critical refrigerant amount capable of keeping the cooling power of ~~said~~ the refrigerating cycle from the comparison result.

20. (Currently Amended) A refrigerating cycle apparatus ~~characterized by~~ comprising:

a refrigerating cycle formed by connecting a compressor, a condenser, expansion ~~means~~ unit and an evaporator via a pipeline and flowing a refrigerant through the inside thereof;

a high pressure side measurement ~~means~~ unit that is high pressure measurement ~~means~~ unit for measuring the high pressure of a refrigerant pressure at any position on a flow passage leading from the discharge side of ~~said~~ the compressor to ~~said~~ the expansion ~~means~~ unit or condensation temperature measurement ~~means~~ unit for measuring the saturation temperature at ~~said~~ the high pressure;

a low pressure side measurement ~~means~~ unit that is low pressure measurement ~~means~~ unit for measuring the low pressure that is a pressure of refrigerant at any position on the flow passage leading from ~~said~~ the expansion ~~means~~ unit to the suction side of ~~said~~ the compressor or evaporation temperature measurement ~~means~~ unit for measuring the saturation temperature at ~~said~~ the low pressure;

a refrigerant temperature measurement ~~means~~ unit that is liquid temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow

passage leading from ~~said the~~ condenser to ~~said the~~ expansion ~~means~~ unit ,
discharge temperature measurement ~~means~~ unit for measuring the temperature at
any position on the flow passage leading from ~~said the~~ compressor to ~~said the~~
condenser, or suction temperature measurement ~~means~~ unit for measuring the
temperature at any position on the flow passage leading from ~~said the~~ evaporator to
~~said the~~ compressor;

a judgement ~~means~~ unit for judging the abnormality of the refrigerating cycle
including a refrigerant leakage by storing the measured values of ~~said the~~ each
measurement ~~means~~ unit or the arithmetic values calculated from ~~said the~~ measured
values, and comparing the stored values and the current measured values or
arithmetic values; and

an output ~~means~~ unit for outputting the refrigerant leakage information in
preference to other abnormalities of the refrigerating cycle, when the refrigerant
leakage is judged.

21. (Currently Amended) The refrigerating cycle apparatus according to
claim 20, ~~characterized by~~ further comprising arithmetic ~~means~~ unit for performing
the arithmetic operation on an aggregate in which a plurality of parameters obtained
from three or more measured values measured by ~~said the~~ each measurement
~~means~~ unit are combined as the plurality of variables and associated with each other
to calculate the arithmetic value, normal state quantity storage ~~means~~ unit for storing
~~said the~~ measured values or the arithmetic values when ~~said the~~ refrigerating cycle
is normally operating, comparison ~~means~~ unit for comparing the distances between
~~said the~~ arithmetic value obtained from ~~said the~~ measured values in the current

operating condition of ~~said~~ the refrigerating cycle and the arithmetic value stored in ~~said~~ the normal state quantity storage means unit or the arithmetic value obtained by making the arithmetic operation on ~~said~~ the stored measured values, and judgement means unit for judging the degree of normality, the degree of abnormality or the cause of abnormality for ~~said~~ the refrigerating cycle from the distances or a change in the distances compared by ~~said~~ the comparison means unit .

22. (Currently Amended) The refrigerating cycle apparatus according to claim 20 ~~or 21~~, characterized by further comprising output means unit for outputting the extent of abnormality of the refrigerant leakage in ~~said~~ the refrigerating cycle as an electric signal or communicating it as a communication code with the outside, in which a plurality of thresholds are set halfway in the distance between ~~said~~ the arithmetic values at the normal operating time and the abnormal operating time, and the refrigerant amount or refrigerant leakage amount within ~~said~~ the refrigerating cycle, or its equivalent arithmetic value, is set according to ~~said~~ the plurality of thresholds.

23. (Currently Amended) The refrigerating cycle apparatus according to ~~any one of claims 12 to 22~~, characterized in that claim 12, wherein the arithmetic value from ~~said~~ the measured values, the numerical value representing the correlation as the plurality of variables, the value obtained by making the arithmetic operation on an aggregate in which ~~said~~ the plurality of variables are combined and associated with each other and calculating the arithmetic operation result, or ~~said~~ the

distance is the Mahalanobis distance or the numerical value calculated from ~~said~~ the Mahalanobis distance.

24. (Currently Amended) A fluid circuit diagnosis method ~~characterized by~~ including comprising:

a measurement step of measuring a plurality of measurement amounts from the physical quantities of a fluid flowing through a circuit in the equipment sucking and discharging the fluid;

an arithmetic operation step of making the arithmetic operation on an aggregate in which a plurality of parameters obtained from ~~said~~ the measured data are combined as a plurality of variables and associated with each other to calculate the arithmetic operation result; and

judgement step of judging whether or not ~~said~~ the fluid is in the normal operating condition by comparing ~~said~~ the arithmetic operation result with a set threshold.

25. (Currently Amended) The fluid circuit diagnosis method according to claim 24, ~~characterized by~~ further including a normal state storage step of storing the arithmetic operation result of ~~said~~ the arithmetic means unit in a state where ~~said~~ the fluid is normally running as a normal operating condition, an abnormal state storage step of storing the arithmetic operation result of ~~said~~ the arithmetic means unit in a state where ~~said~~ the fluid is abnormally running as an abnormal operating condition, and a step of setting a threshold halfway in the distance between ~~said~~ the normal state and ~~said~~ the abnormal state that are stored.

26. (Currently Amended) A fluid circuit diagnosis method ~~characterized by~~ including:

a measurement step of measuring a plurality of measurement amounts from the physical quantities of a fluid in the equipment sucking and discharging the fluid that circulates through a fluid circuit;

an arithmetic operation step of making the arithmetic operation on an aggregate in which a plurality of parameters obtained from ~~said~~ the measurement amounts that are measured are combined as a plurality of variables and associated with each other to calculate the arithmetic operation result; and

a failure preview step of presuming the time elapsed before the fluid within ~~said~~ the fluid circuit becomes abnormal from at least one of the arithmetic operation result at the normal operating time and the arithmetic operation result at the abnormal operating time, ~~said~~ the arithmetic operation results being stored, and the operating time elapsed.

27. (Currently Amended) The fluid circuit diagnosis method according to ~~any one of claims 24 to 26, characterized by~~ claim 24, further including a normal state storage step of storing the arithmetic operation result of ~~said~~ the arithmetic means unit in a state where ~~said~~ the fluid is normally running as a normal operating condition, an abnormal state storage step of storing the arithmetic operation result of ~~said~~ the arithmetic means unit in a state where ~~said~~ the fluid is abnormally running as an abnormal operating condition, and a failure preview step of presuming the time elapsed before a leakage of the fluid out of ~~said~~ the fluid circuit reaches a preset

critical value based on a change in the distance between the current arithmetic operation result of making the arithmetic operation on the plurality of variables at present obtained from the measurement values and at least one of the arithmetic operation result in the normal operating condition and the arithmetic operation result in the abnormal operating condition, ~~said~~ the arithmetic operation results being stored.

28. (Currently Amended) The fluid circuit diagnosis method according to claim 27, ~~characterized in that said~~ wherein the failure preview step includes making the estimation at an interval, in which the arithmetic operation result at the normal operating time as the reference or the data stored as the plurality of variables is plural data learned at every elapsed time.

29. (Currently Amended) A fluid circuit diagnosis method ~~characterized by~~ including:

a measurement step of measuring a plurality of measurement amounts from the physical quantities of a fluid in the equipment sucking and discharging the fluid that circulates through a fluid circuit;

an arithmetic operation step of making the arithmetic operation on an aggregate in which a plurality of parameters obtained from ~~said~~ the measurement amounts that are measured are combined as a plurality of variables and associated with each other to calculate the arithmetic operation result; and

a failure preview step of presuming the time elapsed before the fluid within ~~said~~ the fluid circuit becomes abnormal from at least one of the arithmetic operation

result at the normal operating time and the arithmetic operation result at the abnormal operating time, ~~said~~ the arithmetic operation results being stored, and the operating time elapsed.

30. (Currently Amended) A fluid circuit diagnosis method ~~characterized by~~ including:

a step of reading the arithmetic operation result of making the arithmetic operation on an aggregate in which a plurality of measurement amounts that the physical quantities of a fluid the equipment sucking and discharging the fluid that circulates through a fluid circuit are measured and stored by a plurality of measurement ~~means~~ unit or a plurality of parameters obtained from ~~said~~ the measurement amounts are combined as a plurality of variables and associated with each other from storage ~~means~~ unit connected to ~~said~~ the fluid circuit for which a maintenance order from the maintenance order owner is accepted;

a step of judging whether or not the arithmetic operation result of making the arithmetic operation on the aggregate in which a plurality of parameters obtained from ~~said~~ the read arithmetic operation results or ~~said~~ the measurement amounts are combined as a plurality of variables and associated with each other lies within a preset range; and

a step of communicating the judgement results to the maintenance order owner;

wherein ~~said~~ the judgement results include a plurality of proposals regarding the maintenance contents and the time.

31. (Currently Amended) An equipment monitoring system for monitoring the operating condition of the equipment operated by the an equipment diagnosis device ~~according to any one of claims 1 to 11, characterized in that~~ , wherein

at least one of the instrumentation amounts measured by ~~said~~ the equipment diagnosis device, the operated amounts obtained by arithmetic operation, and the judgement result as to whether or not ~~said~~ the equipment is in the normal operating condition by comparing ~~said~~ the arithmetic values within a set threshold is transmitted via a communication line or the radio communication to a remote monitoring apparatus for monitoring the operating condition of the equipment,

the equipment diagnosis device comprising:

an instrument unit for measuring a plurality of instrumentation amounts for the equipment sucking and discharging a fluid;

an arithmetic unit for performing the arithmetic operation on the correlation between the plurality of instrumentation amounts that are measured; and

a normal state quantity storage unit for storing the state quantities including at least the correlation between the plurality of instrumentation amounts as the state quantities in the normal condition of the equipment, the state quantities being arithmetic values such as a mean value obtained from the instrumentation amounts measured when the operation is judged to be normal, and

the state quantities of the abnormal condition are obtained by making the arithmetic operation from the state quantities of the normal condition stored in the normal state quantity storage unit.

32. (Currently Amended) An equipment monitoring system ~~characterized by comprising failure preview means~~ unit for presuming the time taken until a failure of the equipment occurs based on the arithmetic operation result at the normal operating time, the current arithmetic operation result being obtained by making the arithmetic operation on a plurality of instrumentation amounts obtained from the current operating condition of said an equipment diagnosis device ~~according to any one of claims 1 to 11,~~ and the time elapsed since the arithmetic operation result is stored, wherein

the equipment diagnosis device comprising:

an instrument unit for measuring a plurality of instrumentation amounts for the equipment sucking and discharging a fluid;

an arithmetic unit for performing the arithmetic operation on the correlation between the plurality of instrumentation amounts that are measured; and

a normal state quantity storage unit for storing the state quantities including at least the correlation between the plurality of instrumentation amounts as the state quantities in the normal condition of the equipment, the state quantities being arithmetic values such as a mean value obtained from the instrumentation amounts measured when the operation is judged to be normal, and

the state quantities of the abnormal condition are obtained by making the arithmetic operation from the state quantities of the normal condition stored in the normal state quantity storage unit.

33. (Currently Amended) A refrigerating cycle monitoring system ~~characterized by comprising a remote monitoring apparatus for monitoring the~~

operating condition of said a refrigerating cycle apparatus ~~according to any one of~~
~~claims 12 to 23~~, wherein

at least one of the measurement values measured by said the refrigerating
cycle apparatus, the arithmetic values obtained by arithmetic operation, and the
judgement result as to whether or not said the refrigerating cycle apparatus is in the
normal operating condition by comparing said the arithmetic values are within a set
threshold is transmitted via a communication line or the radio communication,

the refrigerating cycle apparatus comprising:

a refrigerating cycle formed by connecting a compressor, a condenser,
expansion unit and an evaporator via a pipeline, and flowing a refrigerant through the
inside thereof;

a high pressure side measurement unit that is high pressure measurement
unit for measuring the high pressure of a refrigerant pressure at any position on a
flow passage leading from the discharge side of the compressor to the expansion
unit or condensation temperature measurement unit for measuring the saturation
temperature at the high pressure;

a low pressure side measurement unit that is low pressure measurement unit
for measuring the low pressure that is the pressure of refrigerant at any position on
the flow passage leading from the expansion unit to the suction side of the
compressor or evaporation temperature measurement unit for measuring the
saturation temperature at the low pressure;

a refrigerant temperature measurement unit that is liquid temperature
measurement unit for measuring the temperature at any position on the flow
passage leading from the condenser to the expansion unit, discharge temperature

measurement unit for measuring the temperature at any position on the flow passage leading from the compressor to the condenser, or suction temperature measurement unit for measuring the temperature at any position on the flow passage leading from the evaporator to the compressor;

an arithmetic unit for performing the arithmetic operation on the composite variables from the measured values of the high pressure side measurement unit, the low pressure side measurement unit and the refrigerant temperature measurement unit; and

a judgement unit for judging the abnormality of the refrigerating cycle based on the comparison result by comparing the values stored in the past and the current measured values or arithmetic values, as well as storing each of the measured values or the arithmetic values.

34. (Currently Amended) A refrigerating cycle monitoring system characterized by comprising:

a high pressure side measurement means unit that is high pressure measurement ~~means~~ unit for measuring the high pressure of a refrigerant pressure at any position on a flow passage leading from the discharge side of a compressor to expansion ~~means~~ unit in a refrigerating cycle apparatus that constitutes a refrigerating cycle by connecting ~~said~~ the compressor, a condenser, ~~said~~ the expansion ~~means~~ unit and an evaporator via a pipeline and flowing a refrigerant through the inside thereof or condensation temperature measurement ~~means~~ unit for measuring the saturation temperature at ~~said~~ the high pressure;

a low pressure side measurement ~~means~~ unit that is low pressure measurement ~~means~~ unit for measuring the low pressure that is a pressure of refrigerant at any position on the flow passage leading from said ~~the~~ expansion ~~means~~ unit to the suction side of said ~~the~~ compressor or evaporation temperature measurement ~~means~~ unit for measuring the saturation temperature at said ~~the~~ low pressure;

a refrigerant temperature measurement ~~means~~ unit that is liquid temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from said ~~the~~ condenser to said ~~the~~ expansion ~~means~~ unit , discharge temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from said ~~the~~ compressor to said ~~the~~ condenser, or suction temperature measurement ~~means~~ unit for measuring the temperature at any position on the flow passage leading from said ~~the~~ evaporator to said ~~the~~ compressor;

an arithmetic ~~means~~ unit for acquiring the composite variables from the measured values of said ~~the~~ high pressure side measurement ~~means~~ unit , said ~~the~~ low pressure side measurement ~~means~~ unit and said ~~the~~ refrigerant temperature measurement ~~means~~ unit ;

a storage ~~means~~ unit for storing the measured value of said ~~the~~ each measurement ~~means~~ unit and the arithmetic values such as the composite variables by making the arithmetic operation on said ~~the~~ measured values;

a judgement ~~means~~ unit for judging the abnormality of said ~~the~~ refrigerating cycle based on the comparison result by comparing the values stored in the past by

~~said the~~ storage ~~means~~ unit and the current measured values or arithmetic values;
and

a transmission ~~means~~ unit , formed by wire or radio, for transmitting ~~said the~~ measured values or the arithmetic values or the judgement result of ~~said the~~ judgement ~~means~~ unit to a remote monitoring apparatus provided at a site away from ~~said the~~ refrigerating cycle apparatus.

35. (Currently Amended) A refrigerating cycle monitoring system
~~characterized by~~ comprising:

normal state storage ~~means~~ unit for storing the state quantities in the normal operating condition that are acquired or inferred by making the arithmetic operation on the correlation between a plurality of variables from the measurement results when a refrigerating cycle formed by connecting a compressor, a condenser, expansion ~~means~~ unit and an evaporator via a pipeline and flowing a refrigerant through the inside thereof is normally operating;

an abnormal state storage ~~means~~ unit for storing the state quantities in a plurality of abnormal states that are acquired by making the arithmetic operation on the correlation between a plurality of variables from the measurement results of the operation when there is an abnormality in the circulation of the refrigerant in ~~said the~~ refrigerating cycle, or storing a plurality of abnormal state quantities obtained by regenerating the plurality of abnormal states;

a comparison ~~means~~ unit for comparing the distances between the state quantities obtained from the current operating condition of ~~said the~~ refrigerating cycle and the state quantities stored in ~~said the~~ normal state storage ~~means~~ unit or the

plurality of state quantities stored in ~~said~~ the abnormal state storage ~~means~~ unit ;
and

a judgement ~~means~~ unit for judging the degree of normality, the degree of abnormality or the cause of abnormality in ~~said~~ the refrigerating cycle from the distances compared by ~~said~~ the comparison ~~means~~ unit or a change in the distance;

wherein at least one of ~~said~~ the current state quantities, the distances compared by ~~said~~ the comparison ~~means~~ unit or the change in the distance, and the degree of normality, the degree of abnormality or the cause of abnormality for ~~said~~ the refrigerating cycle judged by ~~said~~ the judgement ~~means~~ unit is transmitted by transmission ~~means~~ unit formed by wire or radio.

36. (Currently Amended) A refrigerating cycle monitoring system according to claim 34 ~~or 35, characterized in that~~ wherein the information as to the presumed time taken until a failure of the equipment occurs based on the arithmetic values measured and calculated at the normal operating time and the operating time elapsed of the refrigerating cycle, the arithmetic values being measured and calculated in the current operating condition, is transmitted and displayed to a remote monitoring apparatus via ~~said~~ the transmission ~~means~~ unit.

37. (Currently Amended) The refrigerating cycle monitoring system according to ~~any one of claims 34 to 36, characterized by~~ claim 34, further comprising normal state storage ~~means~~ unit for learning and storing the arithmetic operation result of ~~said~~ the arithmetic ~~means~~ unit as a normal operating state in a condition where ~~said~~ the refrigerating cycle is normally operating, abnormal state

storage ~~means~~ unit for learning and storing the arithmetic operation result of ~~said~~ the arithmetic ~~means~~ unit as an abnormal operating state in a condition where ~~said~~ the refrigerating cycle is abnormally operating such as a refrigerant leakage, and a plurality of thresholds set halfway in the distance between arithmetic operation results of the normal state and the abnormal state that are stored, wherein the distance between the arithmetic operation result of the current operating condition and ~~said~~ the threshold or a temporal change in the distance is displayed in ~~said~~ the remote monitoring apparatus.

38. (Currently Amended) The refrigerating cycle monitoring system according to ~~any one of claims 34 to 37, characterized by~~ claim 34, further comprising output ~~means~~ unit for setting the refrigerant amount or refrigerant leakage amount within ~~said~~ the refrigerating cycle as the arithmetic value equivalent to each amount and outputting the abnormality of ~~said~~ the refrigerating cycle as an electric signal or communicating it as a communication code, wherein if a refrigerant leakage, if detected, is outputted to ~~said~~ the remote monitoring apparatus prior to other judgement results of ~~said~~ the judgement ~~means~~ unit.

39. (Currently Amended) A refrigerating cycle monitoring system comprising:

normal state storage ~~means~~ unit for storing the arithmetic operation result of making the arithmetic operation on the correlation between the physical quantities of a refrigerant in a condition where the refrigerant flowing through a refrigerating cycle is normal, as a normal operating state, abnormal state storage ~~means~~ unit for storing

the arithmetic operation result of making the arithmetic operation on the correlation between the physical quantities of the refrigerant in an abnormal condition where ~~said~~ the refrigerant leaks out of ~~said~~ the refrigerating cycle, and refrigerant leakage foreseeing ~~means~~ unit for foreseeing the time when ~~said~~ the refrigerant leaks out of ~~said~~ the refrigerating cycle by comparing the distances between the arithmetic operation result of making the arithmetic operation on the correlation between the physical quantities of the refrigerant in the current operating condition and at least one of the normal operating condition and the abnormal operating condition that are stored, wherein the foreseen result of ~~said~~ the refrigerant leakage foreseeing ~~means~~ unit is transmitted to a remote monitoring apparatus.